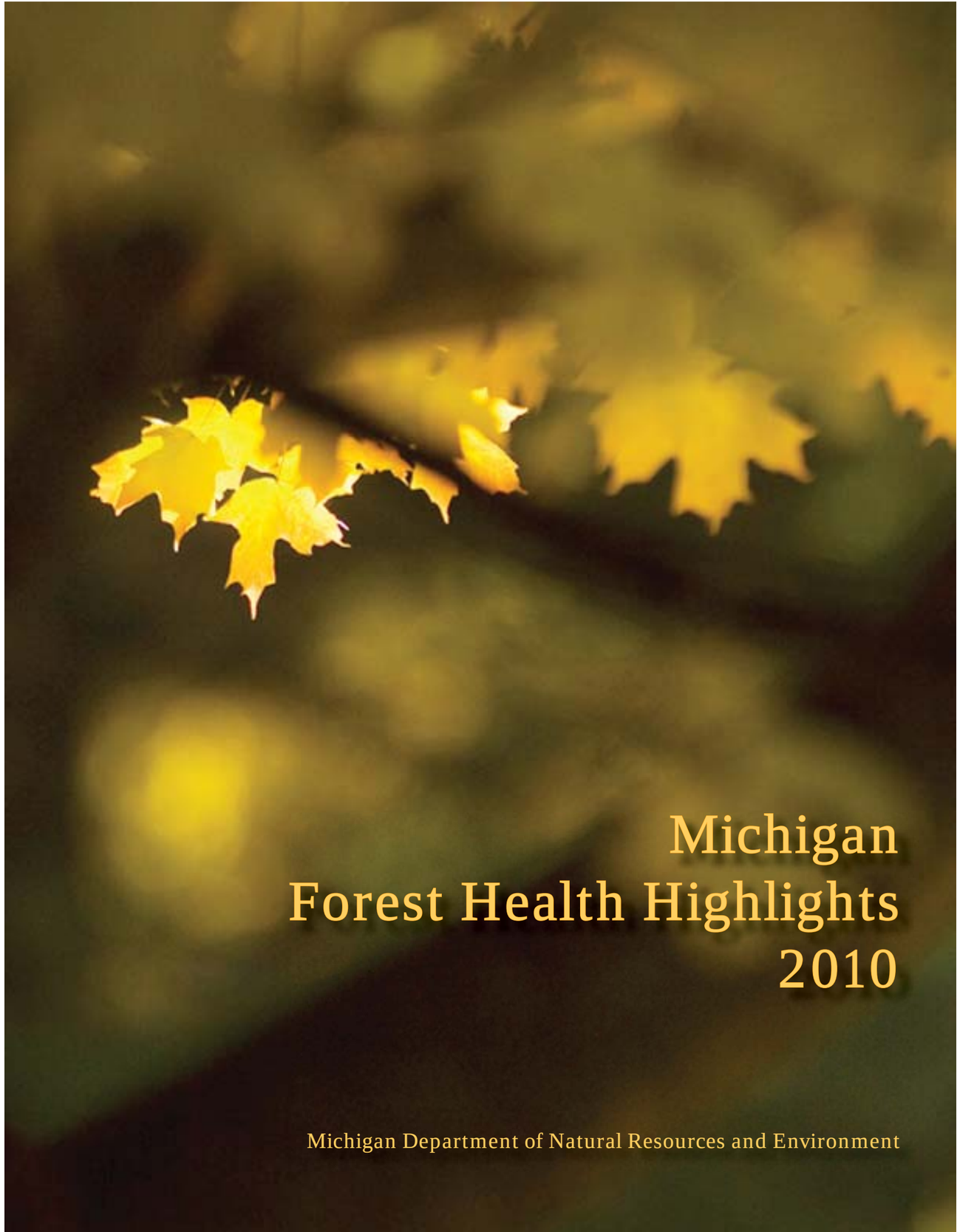
Michigan
Forest Health Highlights
2010
Michigan Department of Natural Resources and Environment

Acknowledgements

Forest Health Highlights is a summary of the condition of Michigan's forests during 2010 and the work done to preserve and protect them by Forest Management Division, Department of Natural Resources and Environment.

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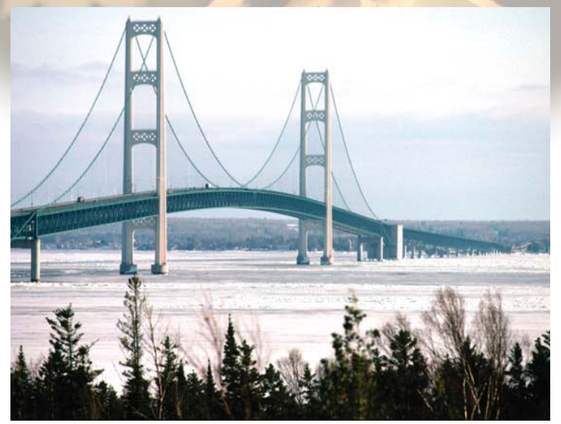
Forest Resource Overview

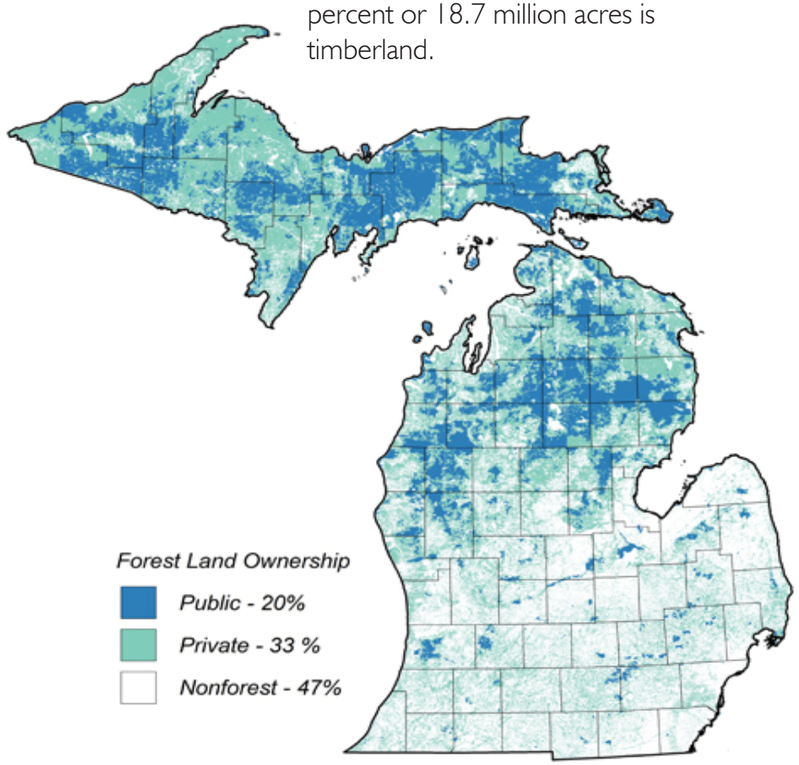
Michigan is a state like no other with two peninsulas. From the warmer agriculture and urban areas in the South to the colder wooded lands in the North, the state offers unique ecosystems, land uses, and one of the most diverse forests in the United States. Nearly all of the forestland in Michigan was cut and/or burned during European settlement. The bulk of the lumber boom and most of the fires occurred in the late 1800s and early 1900s. By 1920, the lumber boom had ended and secondary succession was in full swing with the recovery of the forests.

Today, Michigan has more forestland than any other state in the Northeast or Midwest. Michigan's state forests and a number of large private ownerships are certified as practicing sustainable forestry through the Forest Stewardship Council (FSC) and the Sustainable Forestry Initiative (SFI). The U.S. national forests are managed under the National Forest Management Act and National Environmental Protection Act. There also are numerous assistance programs to help small forestland owners.



- Among the 50 States, Michigan ranks 22nd in land area but 10th in forestland area.

- Forest land accounts for 19.3 million acres or 53 percent of land in Michigan; 97 percent or 18.7 million acres is timberland.



- Sugar maple/beech/yellow birch is the predominate forest type (22 percent of timberland). Aspen (13 percent) is the second most abundant forest type. Northern white-cedar (7 percent) and red pine (5 percent) are the most abundant softwood forest types.

- All prominent species in Michigan have moderate to high percentages of average annual net growth to volume.

- Of Michigan's forestland, 62 percent or 11.9 million acres of Michigan's forest lands are owned by families, individuals, private corporations, and other private groups. The remaining 38 percent (7.4 million acres) is managed by federal, state, and local government agencies.

- 65 percent of the National Forest Inventory & Analysis plots sampled for nonnative species in Michigan had at least one identifiable nonnative species. The Lower Peninsula had higher percentages of nonnative species. Likewise, the percentage of nonnative-species ground cover was higher in the Lower Peninsula.

Insects and Diseases

Healthy and productive forests are comprised of a diversity of native tree, shrub, and herbaceous plant species, as well as an even larger number of faunal species for which forests provide habitat. Forested ecosystems have continuously adapted and evolved over thousands of years, as insect, plant, and animal species are naturally, intentionally, or inadvertently introduced or extirpated from ecosystems. Prevention and mitigation of invasive plants, insects, and disease introductions is important for the maintenance of healthy and productive forests.

From 'Michigan Forest Resource Assessment & Strategy'

June 2010

Annosum Root Rot

Michigan continues evaluating pockets of dead red pine trees for the presence of *Heterobasidion annosum*. To date, *H. annosum* has not been detected north of Lansing, Michigan (south central part of the state). *Annosum* root rot was first reported in the Lake States in 1971. It was first observed in Wisconsin in 1993, and now occurs in 21 counties there. *Annosum* root rot has been most commonly observed on red and white pine plantations in Wisconsin. Infected trees grow poorly and have thin crowns. Symptoms typically appear 2-3 years after a thinning. The tree eventually becomes susceptible to wind throw and dies. Infection centers create gaps in the forest canopy.

Annosum damage in a stand of red pine trees.

The *H. annosum* spore moves from freshly cut tree stumps to other trees through the roots. Insects also transfer the spores between stumps and within roots. Since stumps are slow to decay, they carry the spores for many years. Prevention is the only viable means of control. Borax treatments on freshly cut stumps result in more than ninety percent control of the disease.

Asian Longhorned Beetle

The asian longhorned beetle (ALB) is an invasive insect that attacks 11 genera of deciduous trees: maples, elm, willow, birch, horse chestnut, London planetree, aspen, ash, and mountain ash. The 2008 discovery of a 62 acre ALB infestation in Massachusetts involving thousands of maple trees provided reason and momentum to intensify ALB detection efforts.

Asian Longhorned Beetle on the cross section of an infested log.

The Department of Natural Resources and Environment (DNRE) screened its state park visitor database for visits in the last 10 years from Worcester, MA. They discovered four visits from ALB-infested areas of Massachusetts, two in the Lower Peninsula (Muskegon and Berrien Counties), and two in the Upper Peninsula (Chippewa and Luce Counties). These sites were intensively surveyed. No ALB was detected in Michigan in 2010.

Michigan was awarded USDA Forest Service Cooperative Forest Health funds to assist in ALB surveys. The DNRE will begin conducting intensive statewide early detection and rapid response surveys for ALB in Michigan's state parks and forest campgrounds beginning in spring 2011. DNRE Forest Management Division Forest Health Specialists will train Recreation Division personnel in ALB detection survey and reporting protocols. If Recreation Division surveyors detect ALB signs or symptoms, the Forest Health staff, in cooperation with the state and federal departments of agriculture, will confirm the finding and develop a strategy for eliminating ALB.

Female ALB chew shallow holes into bark for egg laying. The deep hole is where the adult beetle emerged.

Beech Bark Disease

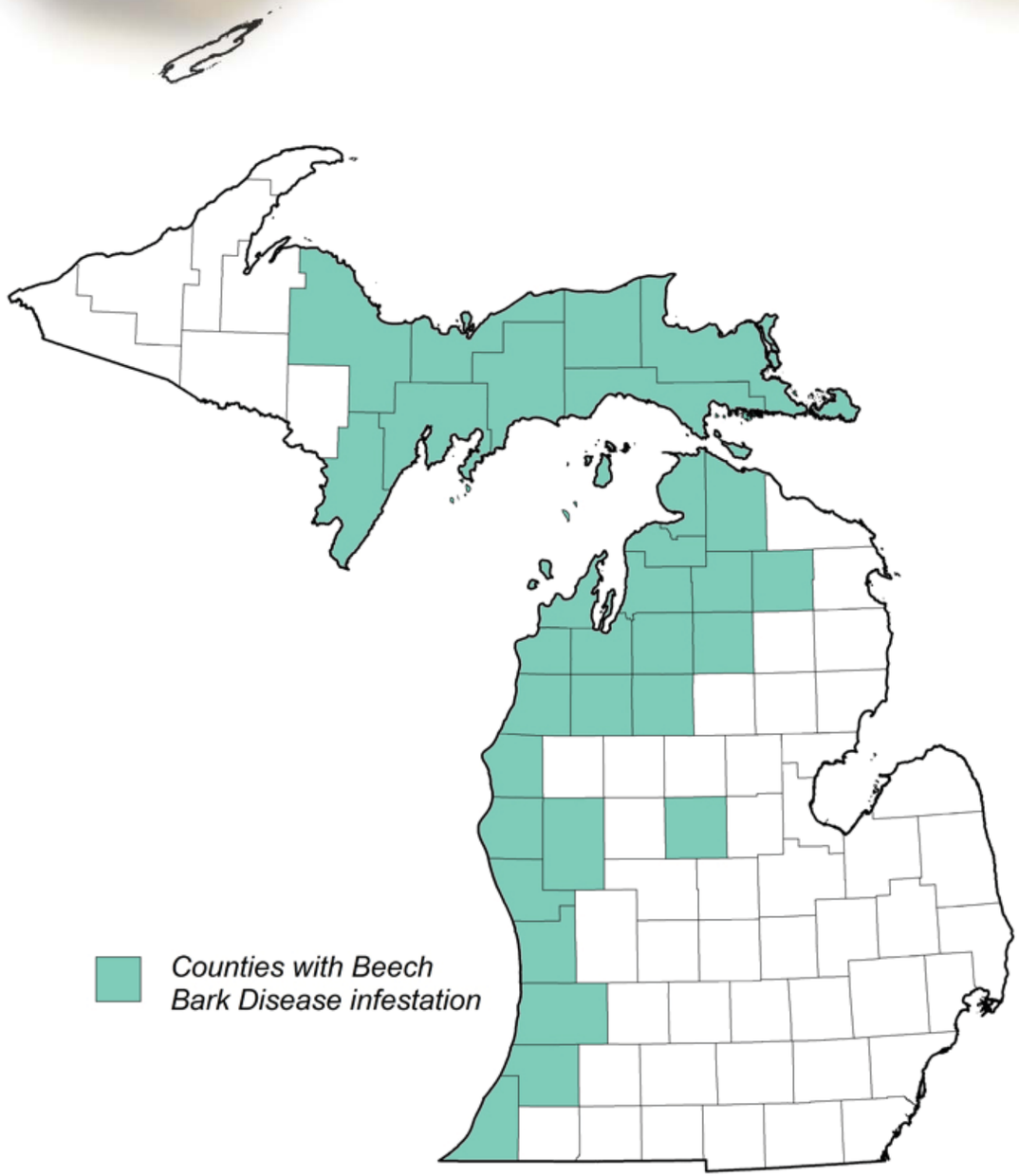
Since its discovery in Michigan in 2000, beech bark disease (BBD) continues to pose a serious threat to Michigan's forests. This disease is initiated by a scale insect that attaches to the tree and feeds off sap from the inner bark layer. Damage from this feeding allows one of two *Neonectria* fungus species to establish itself inside the tree. The fungus prevents the flow of sap, killing infested portions of the tree and eventually the entire tree. Controlling the spread of the disease is difficult because both the scale and fungus can be transported by air. Michigan Technological University received a USDA Forest Service grant in 2009 to continue surveys to mark and protect American Beech in newly affected areas of BBD.

Beech bark disease appears as white dots on the outer bark.

The area of infestation continues to spread east and west in the Upper Peninsula and to new areas in the Northern Lower Peninsula. Spot infestations of the scale insect have been found far outside the primary infestation front.

Since the fungus cannot invade the tree without the scale, researchers are focusing on trees resistant to the scale. The USDA Forest Service Research Facility in Delaware, Ohio, and the DNRE Forest Management Division have been collecting cuttings from scale resistant beech and grafting them onto beech root stock. Fifteen grafts for each of the 20 resistant trees will be used to establish an orchard of 300 resistant trees. In the fall of 2010, the USDA Forest Service, in cooperation with Michigan State University and the DNRE Tree Nursery, began planting Michigan's first American Beech seed orchard using this resistant stock. Ultimately, the seed produced at this orchard will be used to restore beech trees to the forests impacted by BBD.

Beech Bark Disease in Michigan



Emerald Ash Borer

The DNRE is involved in many projects to survey and prepare Michigan's urban and rural forests for arrival of the emerald ash borer (EAB).

Surveying

The Michigan Department of Agriculture (MDA) in cooperation with the USDA Animal and Plant Health Inspection Service, continue to survey the uninfected counties in the Western Upper Peninsula. They deploy purple traps baited with an aromatic lure known as Manuka Oil. Traps are placed around high-risk areas such as campgrounds and sawmills and along travel pathways. Traps are also placed in a few areas in the Upper Peninsula (Houghton, Alger, and Chippewa Counties) near remote single-tree infestations.

Slowing infestation

A pilot project was initiated in 2008 to test the latest concepts for managing EAB populations. The project is called SLAM which stands for "Slow Ash Mortality."

The areas selected for this study include three outlying infestations in the Upper Peninsula (See map). The primary goals of the project include:

- Reducing EAB population growth and rates of tree mortality in the core areas.
- Detecting and preventing satellite populations from expanding and becoming core populations.
- Developing and maintaining regular communications and consistent messages with the local landowners in and around the project area.

EAB Adult (actual length is 1/2-inch

- Assisting local woodland owners and homeowners in making environmentally and fiscally responsible decisions regarding their ash trees and woodlands.

Three Asian wasps that attack EAB eggs or larvae were released in Southern Michigan in 2007: *Tetrastichus planipennisi, Spathius agrili and Oobius agrili.* An MSU researcher found another pest that attacks EAB, *Atanycolus hicoriae*. Two of the three wasps, *Tetrastichus* and *Oobius*, were released in the Upper Peninsula in 2010 at the Houghton and Delta/Schoolcraft county sites.

For more information on SLAM, visit www.slameab.info

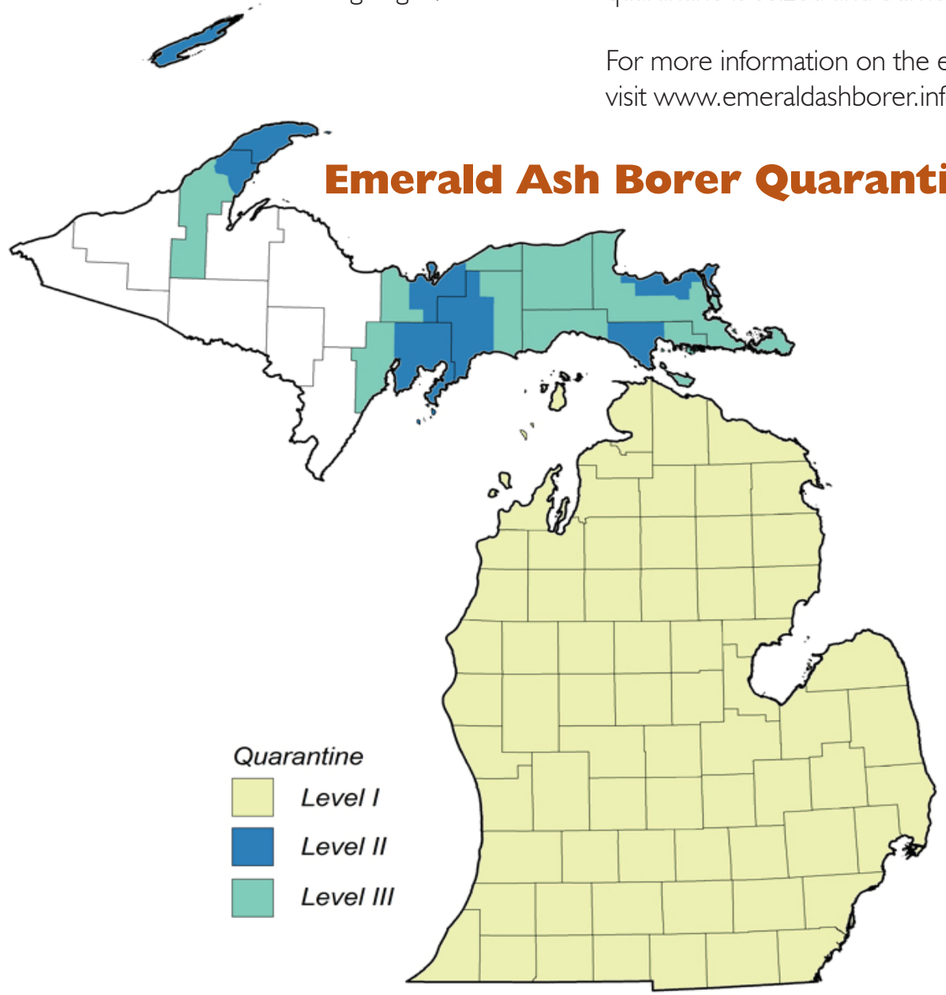
Galleries below ash bark made by EAB larvae.

The current emerald ash borer quarantine encompasses all of the Lower Peninsula and eight of the fifteen Upper Peninsula counties (see map). There are still areas of the Lower Peninsula, especially the Northern areas that have not yet been impacted by EAB. So, although it is legal to move ash wood within the Lower Peninsula, it is advised to limit the movement of ash firewood within the Lower Peninsula as much as possible. For detailed information on the EAB quarantine, visit the MDA website at: www.michigan.gov/mda

The DNRE conducts annual firewood sweeps in December. All hardwood firewood left at state forest campgrounds and parks is burned, eliminating the risk of EAB emerging from infested firewood the following spring. During the camping season, Recreation Division employees inspect all firewood brought in by campers entering state parks. State forest staff conducts random inspections of firewood brought in by state forest campgrounds guests. When found, firewood that is not in compliance with the EAB quarantine is seized and burned.

For more information on the emerald ash borer, visit www.emeraldashborer.info

Emerald Ash Borer Quarantine



Forest Tent Caterpillar

The forest tent caterpillar (FTC) continued to make life miserable for homeowners and woodlot owners across much of the Northwestern Lower Peninsula this year. FTC defoliated 444,772 acres in Northwestern Lower Michigan. Defoliation was very heavy in areas around Gaylord, Cadillac, Traverse City and Petoskey.

Forest tent caterpillars

Widespread outbreaks of FTC occur at approximately every 10 to 15 years. In the past, outbreaks peaked in 1922, 1937, 1952, 1967, 1978, 1990, and 2002. While statewide caterpillar populations may remain high for up to 5 years, outbreaks in any one locality normally last for 2-3 years. Outbreaks decline quickly once parasites and other natural enemies become active.

FTC is a native defoliator of a variety of hardwood trees and shrubs. It feeds primarily on sugar maple, aspen, oaks, and birch but occasionally feeds on other associated hardwoods, particularly during outbreaks. Defoliation normally begins in late-May with the greatest leaf loss occurring in the first three weeks of June.

Defoliation from FTC generally causes little damage to tree health. Heavily defoliated trees develop a second set of leaves a few weeks after being defoliated. These new leaves and leaves formed the year following an outbreak are often smaller than normal.

Trees rarely die from FTC defoliation unless weakened by drought, late spring frost, or other stressors.

During outbreaks, FTC caterpillars can number from 1 to 4 million per acre. They create an extreme nuisance to people living or vacationing in infested forests. Young larvae spin a thread and fall from trees onto picnic tables, patios, and people. Mature larvae wander across the ground in search of food, making for slippery roads and walkways. Mass flights of tent caterpillar moths in late June and early July are common during outbreaks.

Forest tent caterpillars clustered on an aspen tree.

The FTC overwinters in an egg mass on twigs of host trees. Eggs hatch in the early spring about the time of bud break. As caterpillars grow, they are easily identified by the white keyhole-shaped or footprint pattern along their backs.

2010 Forest Tent Caterpillar Defoliation by County

County	Acres Defoliated
Cheboygan	61,613
Antrim	61,182
Montmorency	57,713
Charlevoix	52,335
Wexford	41,937
Otsego	37,747
Manistee	24,796
Alpena	15,623
Alcona	12,570
Emmet	12,407
Missaukee	12,354
Grand Traverse	10,590
Benzie	10,504
Kalkaska	10,151
Crawford	8,512
Osceola	5,354
Oscoda	4,454
Ogemaw	2,187
Lake	1,816
Leelanau	496
Mason	235
Dickinson	140
Mecosta	56

When mature, larvae spin silk cocoons with white to yellow threads on trees, shrubs, buildings, and other objects to begin pupation. Adults emerge 7 to 10 days later. The adult moth has a wingspan of around an inch, is buff-colored and has a broad brown band across the front wings. Adult moths are night fliers and come to lights in large numbers. Well-lit areas like gas stations, parking lots and car dealerships commonly attract large numbers of migrating FTC moths.

The FTC is a native insect that has evolved in the forests of North America. Fortunately, natural controls have also evolved, helping to keep outbreaks from seriously damaging forests. One natural control that causes FTC numbers to decline dramatically is starvation. During the early stages of an outbreak, forests have enough foliage to support rapidly increasing numbers of caterpillars. After a year or two, feeding outpaces leaf production and caterpillars begin to starve. Starvation can kill 75% to 95% of the caterpillar population.

Gypsy Moth

Hardwood forests across much of the Northern Lower Peninsula suffered moderate to heavy defoliation again this spring, although signs are positive that populations will decline dramatically beginning in 2011. The gypsy moth feeds on the foliage of a variety of hardwood trees, including oak, aspen, willow, basswood, birch and dozens of other species. It is common for a population of gypsy moths to defoliate, or eat most of the leaves off trees. When moth populations are high and competition for food increases, they will feed on other tree species, including conifers like spruce and pine.

Gypsy moth

Fortunately, trees usually recover from defoliation as long as they are growing well and have adequate water and nutrients available. Even repeated defoliation rarely kills a tree, unless drought, old age or other stressors have weakened it.

Gypsy moth larva

In 2010, gypsy moth numbers increased dramatically across Michigan's northern Lower Peninsula and parts of the Upper Peninsula, where defoliation was detected on approximately 943,000 acres of forestland. In some areas, gypsy moths and forest tent caterpillars were found feeding in the same forests, particularly where oak and aspen grow together.

Native to Europe, the gypsy moth was accidentally introduced to Massachusetts in the late 1800's and was first detected in Michigan in the 1950's. Populations spread steadily in the 1970's and, by the late 1980's, gypsy moths were devouring hundreds of thousands of acres annually.

Gypsy moth egg mass

Gypsy moth infested tree.

Since then, a natural system of parasites, predators, and fungi has become established to speed the collapse of outbreaks and to keep gypsy moth populations low for longer periods of time. In many Michigan forests, gypsy moth now behaves like a native insect, with short periodic outbreaks followed by extended periods of low activity.

This current outbreak is expected to begin subsiding in 2011. Cool, wet weather next spring will encourage the spread of *Entomophaga maimaiga*, a fungus that kills large numbers of gypsy moth caterpillars before they can develop into adults and lay eggs.

For more information about gypsy moths visit, w www.fs.fed.us/ne/morgantown/4557/gmoth/

2010 Gypsy Moth Defoliation by County

County	Acres Defoliated
Clare	88,107
Gladwin	80,693
Otsego	77,603
Montmorency	76,255
Roscommon	74,857
Cheboygan	62,783
Ogemaw	60,861
Antrim	55,614
Wexford	54,227
Charlevoix	51,102
Midland	45,496
Missaukee	44,833
Crawford	28,514
Manistee	27,496
Alpena	19,471
Bay	16,349
Alcona	13,102
Emmet	12,193
Kalkaska	9,230
Grand Traverse	8,125
Isabella	6,969
Oscoda	5,994
Osceola	5,354
Arenac	4,721
Benzie	4,177
Presque Isle	3,557
Iosco	2,945
Lake	1,816
Alger	363
Houghton	347
Ontonagon	266
Mason	235

Hemlock Wooly Adelgid

Hemlock Wooly Adelgids

The Eastern hemlock is an important component of Michigan's forests. Based on inventory data, it exists in over 12% of the state's timberlands. The hemlock wooly adelgid (HWA), *Adelges tsugae*, is a small aphid-like insect. This insect is native to Asia and was transported to the United States on trees brought into the U.S. from that region. The HWA feeds by piercing small branches of hemlocks and feeding on the sap within. Infested needles turn brown and die. Infested hemlock trees often die within several years. Drought conditions, and damage from other insects or diseases can increase the rate at which trees die.

HWA was found on naturally-growing hemlock near Harbor Springs, Michigan in August 2006. This is the third time this pest was found in Michigan and the first time the insect was reported outside of nursery stock. It is believed the insect arrived with infested landscape trees that were shipped from outside Michigan. HWA has been attacking Eastern and Carolina hemlock in the Eastern forest since its initial discovery near Richmond, Virginia in 1951.

Since 2006, the DNRE and Department of Agriculture have cooperated in early detection surveys for the HWA. The surveys in 2007, 2008 and 2009 found no additional infections. In 2010 however, surveyors found new infestations on ornamental hemlock trees in three counties: Emmet, Macomb, and Ottawa.

A second insect, the elongated hemlock scale insect (EHS) is believed to increase the damage caused by HWA. This insect arrived from Japan in the early 1900s and has been documented in Michigan. Health decline in hemlocks has been documented in the Eastern forests where populations of EHS are high, but not in Michigan. Some evidence indicates that damaging outbreaks of EHS can occur where HWA feeding is heavy. EHS surveys are being conducted along with HWA surveys in Michigan.

Jack Pine Budworm

The number of acres defoliated by the jack pine budworm increased in 2010, but remains below average annual defoliation levels for the period 1999 through 2008. Typically, budworm populations remain high for 2 to 3 years and then decline quickly due to egg and larval parasites and death of larvae during the winter. Statewide the number of acres can remain high for several years as budworm populations establish in forests where trees are at risk due to old age or other stressors.

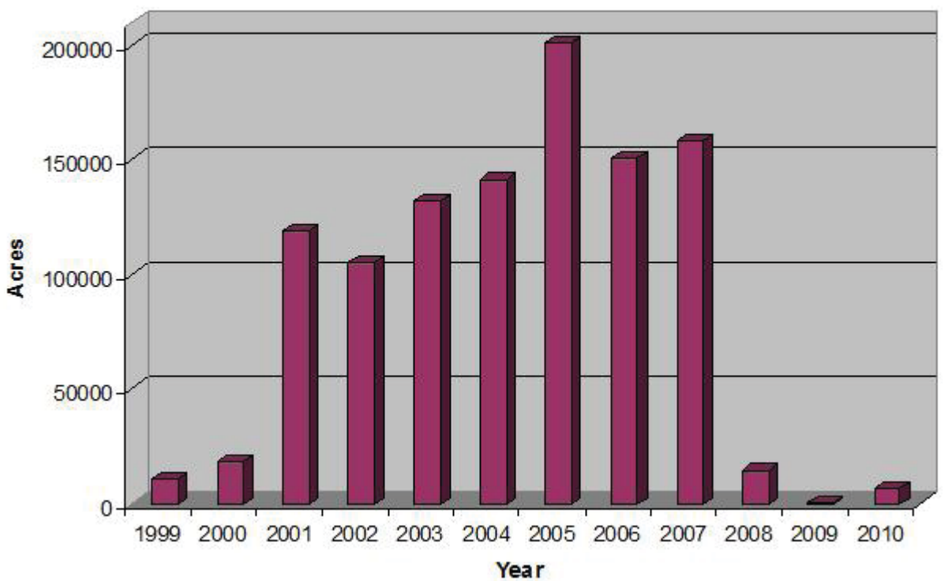
Jack Pine Budworm

The budworm is the most significant pest of jack pine in North America. Stands of jack pine become more susceptible to damage as they age. Jack pine over 50-60 years old that have suffered 2 or more defoliations over a 3-year period is at highest risk of death. To control budworms, foresters harvest trees about 5 years prior to the stand reaching full maturity. This approach has significantly reduced the incidence of jack pine death caused by budworm.

Counties with Jack Pine Budworm Defoliation in 2010

Clare
Delta
Montmorency
Ogemaw
Roscommon

Jack Pine Budworm Defoliation 1999-2010



Oak Wilt

Oak leaves showing signs of oak wilt.

Oak wilt (*Ceratocystis fagacearum*) is one of the most serious tree diseases in the Eastern United States, killing thousands of oaks each year in forests, woodlots, and home landscapes.

Oak wilt was first identified in 1944. The extent of its impact wasn't realized until the 1980's. Only in the last few years has oak wilt been reclassified as an exotic disease.

Although oak wilt can infect many species of oak trees, trees in the Northern red oak, pin oak, black oak, scarlet oak, and red oak hybrids are most susceptible. Infected red oaks die within days or weeks of being infected. Members of the white oak group are much less susceptible and rarely die from the disease. Oak wilt spreads from tree to tree through connected root systems. Untreated, the fungus spreads to adjacent red oak trees, often killing large groups of trees within a few years eventually killing all nearby, root-grafted oaks. Oak wilt spores that can spread the disease overland are produced only in the year following tree mortality. Insects move these spores to fresh oak wounds from April through July. Trees, logs and firewood from killed trees produce these spores.

Oak wilt is established widely in the Southern Lower Peninsula with spotty distribution in the Northern Lower and Upper Peninsulas. One method of spread is by movement of firewood, so as the public moves northward into forested areas, the risk of spreading this disease grows. Cut wood is used on camping trips where it can be a source of fungus the following year.

Property values can be significantly reduced due to the loss of many trees when a single tree is infected. Acorns produced by oaks are a valuable food source of wildlife. More than 180 different kinds of birds and mammals use oak acorns; including popular species such as white-tailed deer, squirrels, turkey, wood ducks, woodpeckers and others.

Effective oak wilt management programs use a variety of strategies to limit the spread of oak wilt.

- Avoid wounding oaks from April 15 to July 15.

- Do not move infected wood off-site without debarking, chipping, or properly drying it. If infected wood cannot be destroyed before the following April, tightly cover cut logs or firewood with plastic tarps from April 15 to July 15.

Oak wilt

- Stop the underground spread of oak wilt by breaking root-graft connections between likely diseased and healthy oaks.

- Special plows used to lay underground cable are used to break roots, stopping the underground spread of oak wilt.

- If oak wilt is caught in the year it was introduced, removing the infected tree and stump removes oak wilt without impacting adjacent oaks.

Oak Wilt Initiatives

The USDA Forest Service continues to provide oak wilt suppression funds, supporting joint MSU Extension and DNRE efforts to rid the Upper Peninsula of oak wilt. The objectives of this program are to:

- Remove oak wilt from the Upper Peninsula by detecting and treating oak wilt pockets.

- Educate affected communities to prevent the reintroduction of oak wilt.

- Demonstrate an effective approach for detecting and treating oak wilt throughout Michigan.

In 2010, a vibratory plow was used to break grafted oak roots and establish barriers at 38 oak wilt areas in Menominee and Dickinson Counties. About 270 oak wilt areas have been successfully eliminated to date.

A second grant from the USDA Forest Service will be used to detect, confirm and record oak wilt in a national database. The oak wilt database serves two needs:

- An impact analysis needed to project expected short and long-term resource losses.

- Operational guidance for prevention and suppression efforts.

Staff use a clamshell excavator to remove the stump of an infected tree and cut root grafts before fungus can move to adjacent healthy trees.

Oak Wilt – ARRA Project

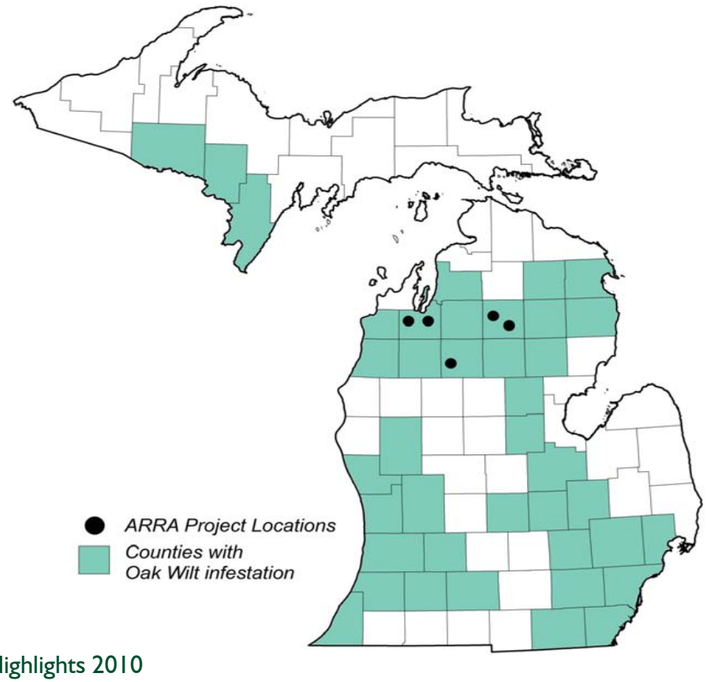
In 2010, the DNRE received American Recovery and Reinvestment Act (ARRA) funds to identify and treat oak wilt outbreaks in high-use recreation areas and in high-value stands of red oak in the Northern Lower Peninsula. As oak wilt establishes in new areas, spores produced by the fungus increase the likelihood of transmission to healthy oak trees. The risk of movement of oak wilt through spring and early summer wounds and firewood are at historic highs. Early detection and treatment of oak wilt outbreaks in urban, rural and forest landscapes can slow the spread of the disease and minimize the potential impact to Michigan's oak trees.

Through a combination of aerial and ground surveys, staff identified oak wilt on 3,026 acres of state forestland in Crawford, Missaukee, and Grand Traverse Counties. Active pockets of oak wilt were defined and trees showing symptoms of oak wilt were marked as potential spore-producing trees. Root graft barriers were established between infected trees and healthy trees using a vibratory plow. Over 47,000 feet of plow line was installed. Infected trees were cut and destroyed or sold for timber. Trees moved out of the forest are handled in a way that ensures the disease will not spread to new areas.

In some state forest campgrounds, herbicides were applied to cut oak stumps to eliminate sprouting of oak trees that would be susceptible to the disease in the future. Oak wilt poses a unique threat in recreation areas where dead and dying trees can create hazards.

Because the fungus can remain in root systems for up to 3 years, treatment areas will be monitored during this period to ensure that the disease has been eliminated.

Counties with Oak Wilt 2010



Sirex noctilio

Since its detection in New York state in 2004, the European wood wasp, *Sirex noctilio*, has been confirmed at trap sites throughout the Eastern Great Lakes region of Ontario, Canada. This exotic wood wasp (commonly referred to as horntail wasp) is native to Europe, Asia and Northern Africa and was collected in Fulton, New York in September 2004, the first time the insect was found in North American forests.

Sirex noctilio

This wasp is rarely a pest in its native areas where it confines its attacks to dead or dying conifer trees. In areas where it has been introduced, however, *Sirex* poses a possible threat to trees that are already stressed due to age, drought or competition from other trees. *Sirex* wood wasp populations may build up in stressed trees and then spread to areas of healthy trees. Widespread outbreaks have occurred in Australia, New Zealand, South Africa and South America.

Female *Sirex* are attracted to stressed trees where they dig into the outer bark, deposit their eggs and introduce a toxic mucus and fungus (*Amylostereum areolatum*). Larvae feed on the fungus, which, together with the mucus, kills the trees. Symptoms of *Sirex* infestation include:

- Exit holes approximately 1/8 to 3/8 inches in diameter.
- Tree needles turning light green then yellow to reddish brown in the late spring or early summer.
- Larval galleries (tunnels) in the wood, packed with a fine powdery frass (insect-produced sawdust).
- Beads or streams of resin on the trunk, seeping from holes in trees.

Pitch or resin will often weep from the tiny holes made by the adult females when they lay their eggs. The damage can be very subtle or quite obvious.

Resin seeps from holes in an infected tree.

The Michigan Department of Agriculture, in cooperation with the Eastern regional office of the USDA Animal and Plant Health Inspection Service's Plant Protection & Quarantine (PPQ), conducted a *Sirex* survey in 18 Southeastern Michigan counties and in Chippewa and Mackinac Counties in the Upper Peninsula.

In Michigan, most 2- and 3-needle pines are considered susceptible, including Scotch, jack, red and Austrian pines. Traps were placed in areas with susceptible trees and baited with 70% alpha-pinene/30% beta-pinene blend, which attracts adult wasps.

A new detection of *Sirex* was made in Saginaw County in 2010. Trapping data from across the region indicates that *Sirex* populations are spreading along the shoreline of Lake Huron to the north after being introduced into Michigan from Ontario, Canada.

For more information about *Sirex*, visit:

www.na.fs.fed.us/spfo/pubs/pest_al/sirex_woodwasp/sirex_woodwasp.htm

www.aphis.usda.gov/plant_health/plant_pest_info/sirex/index.shtml

www.treesearch.fs.fed.us/pubs/12997.

To determine whether an insect that you have collected is *Sirex noctilio*, contact the MSU Plant Pest Diagnostic Clinic at 517-355-4536, or your local MSU county Extension office.

Counties affected: Saginaw, Huron, Sanilac, St. Clair and Macomb.

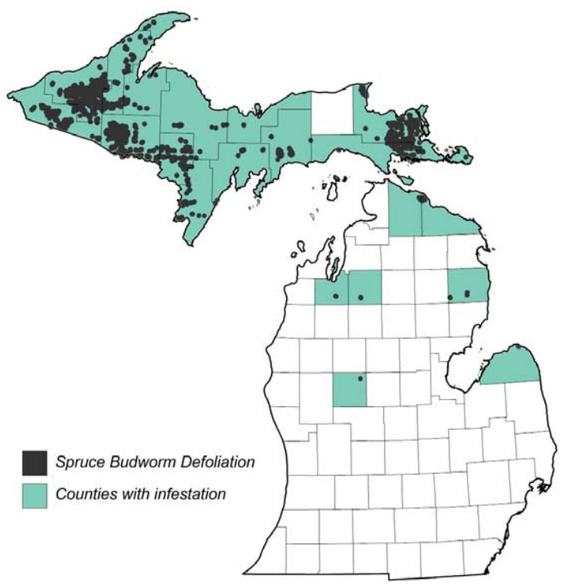
Spruce Budworm

The spruce budworm outbreaks periodically cause extensive damage and tree mortality in Northern spruce and fir forests across the Eastern United States and Canada. Balsam fir is the species most severely damaged. Spruce mixed with balsam fir is more likely to suffer budworm damage than spruce in pure stands.

Spruce budworm damage to a forest.

Defoliation of white spruce and balsam fir increased significantly in Michigan's Upper Peninsula in 2010. Repeated defoliation of mature and over mature spruce and fir has occurred in isolated areas. Top kill and tree mortality is common in these stands. Periodic outbreaks are part of the natural cycle associated with maturing trees. Since 1909 there have been recorded outbreaks of the budworm in both the Eastern United States and Canada. Outbreaks typically last 10-15 years and result in the loss of millions of trees. It is too early to know whether the current buildup of spruce budworm in Michigan is the beginning of a major budworm epidemic. Drought cycles over the last decade may have contributed to the current buildup. If the trend continues significant loss of trees can be expected.

Counties with Spruce Budworm Defoliation in 2010



2010 Spruce Budworm Defoliation by County

County	Acres Defoliated
Ontonagon	49,742
Iron	27,882
Chippewa	27,237
Mackinac	15,855
Gogebic	15,170
Dickinson	11,371
Schoolcraft	11,010
Houghton	7,109
Menominee	4,414
Presque Isle	3,162
Baraga	1,776
Marquette	1,201
Cheboygan	657
Delta	566
Keweenaw	398
Huron	166
Alcona	127
Kalkaska	113
Grand Traverse	66
Alger	54
Mecosta	14

Thousand Cankers Disease of Walnut

In May, the Michigan Department of Agriculture established a quarantine to protect walnut (*Juglans spp.*) from thousand cankers disease (TCD). TCD is an insect-disease complex involving the walnut twig beetle, *Pityophthorus juglandis*, and a fungus, *Geosmithia morbida*.

TCD currently occurs in Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Washington, and Utah, states where the walnut twig beetles are native. The disease affects only Eastern black walnut that has been transplanted in these Western states; native walnut species appear to be resistant. Walnut twig beetles carry the fungus to black walnut trees where cankers form at the feeding site. Heavily attacked trees produce many cankers, which eventually kill the trees. It appears that the range of this beetle is expanding eastward, threatening walnuts in adjacent states. In July 2010, TCD was found east of the Mississippi in Knoxville, Tennessee.

Michigan's quarantine restricts movement of the following from infected states into Michigan:

- All plants and plant parts of the genus *Juglans,* including but not limited to: nursery stock, budwood, scionwood, green lumber; other living, dead, cut, or fallen wood, including logs, stumps, roots, branches; composted and non-composted chips.
- Hardwood firewood.
- Any article, product, or means of transport that risk the spread of the walnut twig beetle or fungus.

Articles, which are are not a threat and are exempt from the quarantine include:

- Nuts, nut meats, and hulls.
- Processed lumber that is 100% bark-free, kiln-dried with squared edges.
- Finished wood products without bark.

Upper Peninsula Forest Pests

European snout beetles on Grand Island

European snout beetle
Photo by Gyorgy Csoka, Hungary Forest Research .

The European snout beetle (*Phyllobius oblongus L*) defoliated sugar maple on Grand Island for the second year. Maples in some local areas were completely stripped of leaves. This is an uncommon occurrence.

Ixoides adults in the Northern Upper Peninsula

Ixoides scapularus
Photo by Scott Bauer

During October, the DNRE received numerous reports of *Ixoides scapularus* adults, commonly known as the deer tick, in the Marquette vicinity of North Central Upper Peninsula. This is the tick that carries Lyme disease. Identification of adult ticks brought to DNRE offices confirmed these reports. This expands the DNRE's understanding of the distribution of *Ixoides* from the Southern portions of the Central and Western Upper Peninsula Northward to the most northern reaches of the Central Upper Peninsula.

Sirococcus reemerges in Alger County

Sirococcus destroys needles on red pine.

Sirococcus shoot blight (*Sirococcus strobilinus Preuss*) affected a small pocket of 10-12 foot red pine south of Munising in Alger County. *Sirococcus* had been recorded about a mile west of this site in the past, but was thought to have been eradicated three years ago.

Sirococcus shoot blight affects conifers, especially seedlings and saplings, in the Northern United States and Southern Canada. The fungus infects new shoots. *Sirococcus* shoot blight has become increasingly widespread since the early 1970's. When favorable conditions for infection occur, tree mortality and shoot death increase.

Maple Tar Spot

The number of Norway maples and their varieties (e.g. Crimson King, Schwedler) affected by maple tar spot decreased in 2010. Maple tar spot is an unsightly leaf disease caused by a fungus, *Rhytisma spp*. There were still some scattered reports of maple leaves covered with large tar spots beginning in August. Maples are not harmed by this late season loss of leaves.

Tree Decline

Tree decline refers to a gradual loss of tree growth and vigor. Declining trees often have some combination of off-color leaves, early leaf drop, poor growth and dieback of twigs and branches. This condition usually progresses slowly over several years. During this time trees may be susceptible to some combination of insect attacks, diseases, and adverse weather conditions like drought and late frosts. These stressors can further reduce growth and may increase the likelihood of tree death.

Aspen Decline

Aspen decline continues to be reported in many areas of the Lake States. The first reports were recorded in 2008.

Observations include:

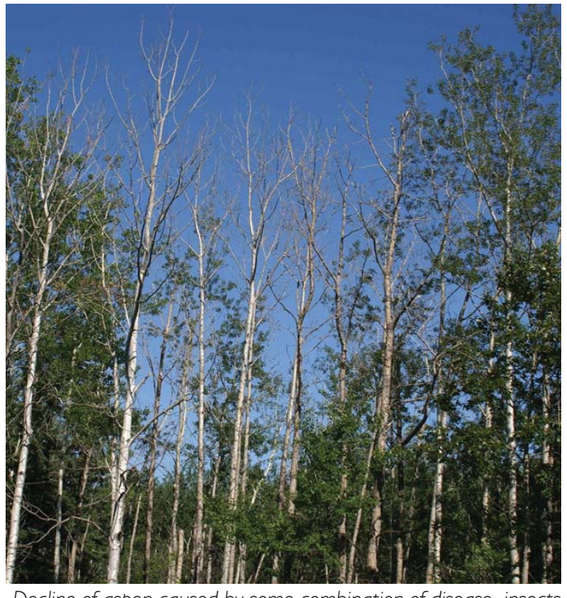
- Thin crowns with small leaves.
- Increased rates of top kill and tree mortality.

A similar decline in aspen was observed after the extreme 1976-77 drought. It is thought that the droughts of the past decade, most notably in 2002-03 and 2006-07 and some areas of the Upper Peninsula in 2008, have predisposed aspen to attacks by secondary pests. These problem areas occur in pockets, likely corresponding to aspen clones, site conditions and/or older clones. A similar decline in aspen was observed after the extreme 1976-77 drought. Other observed pests included *Armillaria* root rot, the bronze poplar borer (*Agrilus lirgus*), and *Septoria* leaf spot (*Septoria musiva*).

Poplar borer

Mortality of larger aspen is often associated with *Hypoxylon* canker. Significant periodic defoliation by the forest tent caterpillar, gypsy moth and the large aspen tortrix in the last decade has also contributed to this decline in aspen vigor and overall health. The aspen leafblotch miner (*Phyllonorycter apparella*) and *Septoria* leaf spot discolored aspen canopies in many parts of the state in 2010.

Aspen Leafblotch Miner



Decline of aspen caused by some combination of disease, insects and environmental stresses.

Hickory Decline

Decline and death of bitternut hickory, *Carya cordiformis*, was reported in Michigan for the first time in 2010. Hickory decline has been reported in several Northeastern states and Wisconsin for the past 5 years. The decline is characterized by thinning crowns with small, yellow leaves. This problem has historically been attributed to outbreaks of the hickory bark beetle, *Scolytus quadrispinosus*, during extended periods of drought. Recently a new fungus, *Ceratocystis smalleyii*, associated with the bark beetle is causing numerous bark cankers. The cankers impair the trees' ability to transport water and nutrients.

Cankers underneath the bark of an infected hickory.

During 2010, hickory decline occurred along the Menominee River in Southwest Menominee County. Bitternut hickory is at the Northern limit of its range in this area and represents only a minor component of the forest. It appears that all the hickory along the river was affected, and that these trees had been under attack for several years without expressing symptoms until August. Unverified reports of hickory decline in adjacent Dickinson County have also been received.

Defoliation of hickory trees.

Maple Decline in the Western Upper Peninsula

Maple decline has been reported for the last few years in Michigan's Western Upper Peninsula. A combination of soil conditions, management practices and drought are thought to have been factors.

In order to determine the causes and rate of spread of maple decline, Michigan Technological University received a grant from the USDA Forest Service. The grant will also be used to determine the distribution of maple decline. One hundred and twenty plots have been established on public and private lands in Michigan, Wisconsin and Minnesota.

Sixty of the plots, established in 2010 in sugar maple forests, showed a loss of 5 to 28 percent of the trees. Information gathered on each plot include: trunk conditions, leaf coverage, earthworm density, soil nutrients and leaf nutrients. Staff collected tree borings to examine the growth rings. The DNRE will use the information to select forest management practices that will reduce or halt the decline of maples.

White Pine Decline

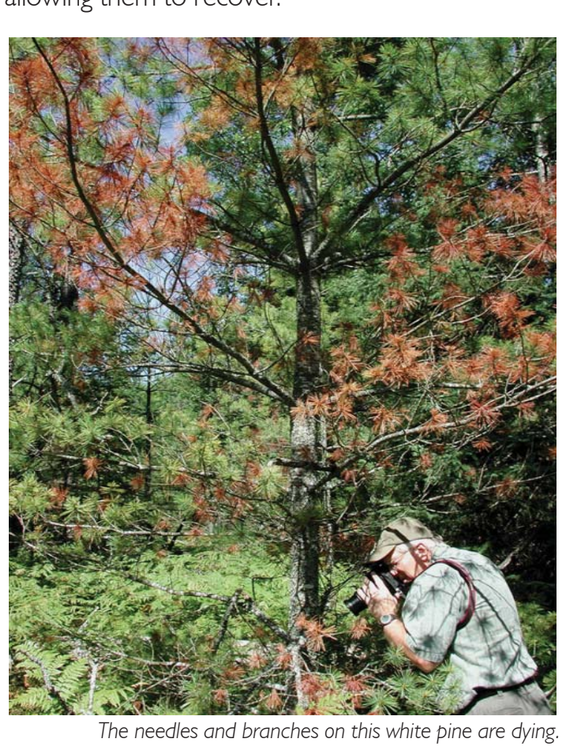
For the past five years, white pine branches and trees have been dying in Michigan's North Central Lower Peninsula. Smaller white pine trees growing along the Manistee and AuSable rivers have been most severely affected. Several opportunistic fungi – pathogens that do not affect healthy trees but can cause problems in stressed trees – have been identified on these trees. In addition, pine spittlebug and *Diplodia scrobiculata* (a fungus that causes stem cankers) are common on these trees. Pine spittlebug is a sap-feeding pest of white pine in the Lake States, where populations periodically build up during dry periods and cause branches to die. The DNRE has also identified *Armillaria*, a root rot fungus that frequently attacks stressed hardwood and conifer trees.

Pine spittlebug

Canker underneath the bark of a white pine.

In much of this area, white pine grows along with pin oak, a short-lived tree that grows on dry, sandy soil common to this part of the state. These pin oak trees act as a 'nurse crop' for young white pine seedlings, providing protection from sun-loving insects and other pests until the white pine can become established. Many of these oak branches and trees have been dying, most likely triggered by drought, old age and frost damage, then exacerbated by *Armillaria* and the two-lined chestnut borer.

This combination of insects and diseases appears to be responsible for much of this white pine branch and tree death, with drought the most likely cause for weakening the trees. A return to normal rainfall patterns should improve overall tree health, allowing them to recover.



The needles and branches on this white pine are dying.

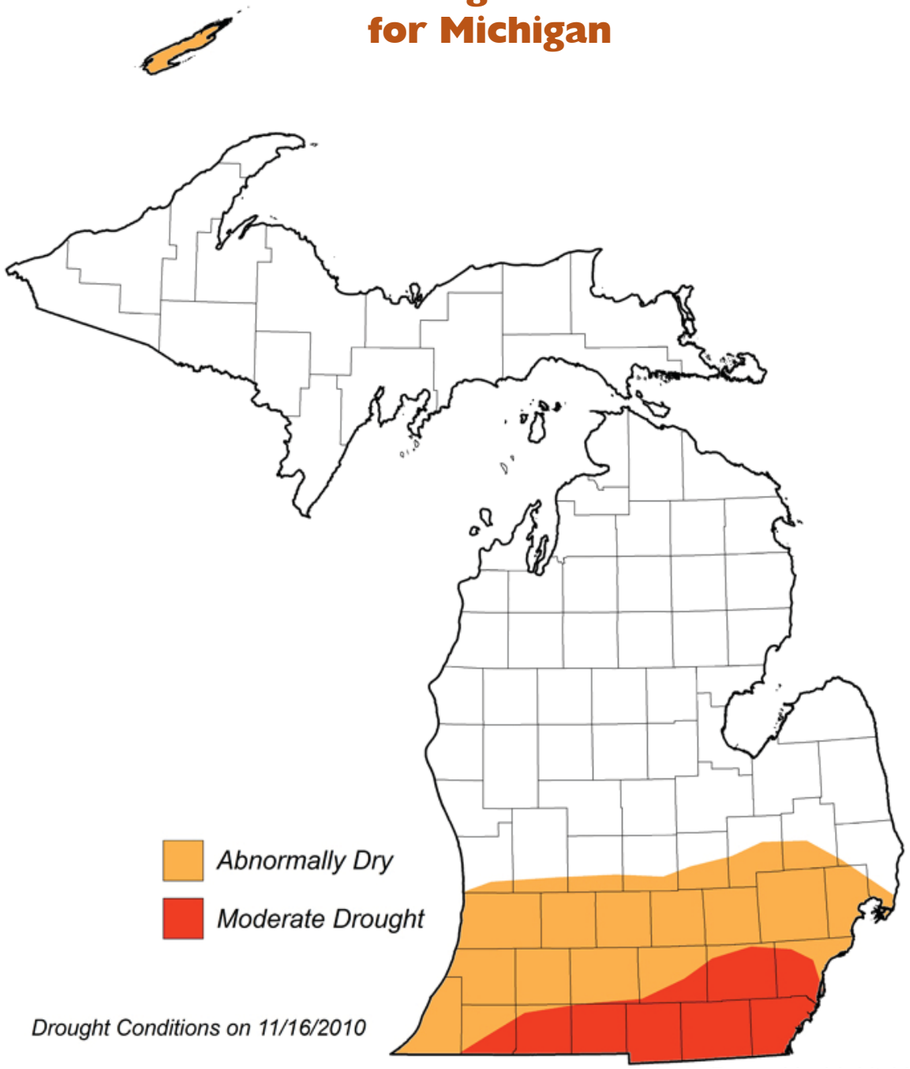
Drought

Following the 2006-2008 drought, rainfall returned to near normal levels beginning in 2009. Areas in the extreme Southern portion of the Lower Peninsula are currently experiencing moderately dry conditions (See Michigan Drought Monitor Map). Although we are in the second year of near normal rainfall, it takes years for trees to rebuild food reserves. The drought has been a major influence on tree health, especially in the Western Upper Peninsula and parts of the Northern Lower Peninsula, which saw consecutive years of extreme drought.

2010 Drought in Michigan

Droughts can trigger significant declines in tree canopy health. Hardest hit are trees that grow in light, sandy soils or on lowlands exposed to significant water table fluctuations. Drought-stressed trees are susceptible to a host of insect pests and diseases. As a result of dry conditions in 2010 tree mortality increased. Oak was affected by the two-lined chestnut borer (*Agrilus bilineatus*); paper birch was affected by the bronze birch borer (*Agrilus anxius*); larch was affected by the Eastern larch beetle (*Dendroctonus simplex*), and jack and red pine saplings were affected by *Diplodia* and *Armillaria*. Defoliators such as the gypsy moth, linden looper, fall cankerworm and spruce budworm were also epidemic. It will take a few years of normal or higher amounts of precipitation for trees to return to normal growth patterns.

U.S. Drought Monitor for Michigan



Invasive Plant Projects

The existence and health of Michigan's natural places depends on controlling the introduction and spread of invasive plants. Invasive species are foreign to the ecosystem and are likely to cause economic, environmental or human harm.

American Recovery and Reinvestment Act

In 2010, the Michigan DNRE contracted the inventory and removal of invasive plant species from five forest areas (Maxton Plains, Shakey Lakes, Van Etten Flood Plain, Camp Grayling, and locations along the AuSable River) with funding provided by the American Recovery and Reinvestment Act (ARRA). Staff identified many species of invasive plants, including: spotted knapweed, purple loosestrife, common mullen, St. John's-wort, Canada thistle, leafy spurge and white sweet clover.

In some locations, a number of native, rare, or endangered species were also found near the invasive species, requiring care in planning and removing the invasive plants. Rare or endangered species encountered include: prairie dropseed, false pennyroyal, downy oatgrass, Cooper's milk vetch, calypso orchid, Hill's thistle, Richardson's sedge, bulrush sedge, flattened spike rush, prairie avens, Alaska orchid and small skullcap.

The surveys were completed in 2010. The DNRE will continue treatment and removal of the invasive plants in spring and early summer of 2011. Various control methods will be used including hand pulling and disposal, hand swiping with herbicide, spot sprays targeted to individual plants and small groups of plants. Directed herbicide sprays will be used to protect native, rare, or endangered plants. Special care will be taken within 25 feet of threatened or endangered species to ensure that these plants are not harmed. The DNRE will monitor the treated areas to determine effectiveness.

Monitoring and Controlling Invasive Knapweed

The DNRE Wildlife Division completed a statewide Invasive Plant Strategy in 2010. One of the major priorities identified in this plan was the control of spotted and diffuse knapweed. The DNRE contracted the release and monitoring of biological control agents shown to be effective in controlling these plants. There were five release sites in Schoolcraft, Missaukee, Crawford, Montcalm and Jackson Counties.

The objective of this project is to control knapweed by introducing natural predators, *Larinus minutus*, a knapweed flower weevil, and *Cyphocleonus achates*, a knapweed root weevil. The goal is to restore these areas with native plants that flower in midsummer and replace the nectar sources used by Michigan's honeybees.

Invasive Knapweed